

1. A nozzle for discharging at least one liquid filament onto a moving substrate, comprising:

a nozzle body having a first side and a second side, said first side including a liquid supply port and an air supply port adapted to couple  
5 with respective liquid and air supply passages of a module body, and said second side including a recess;

a first frusto-conically shaped protrusion on said second side including a base positioned within said recess, an apex and a side surface converging toward said apex;  
10 a liquid discharge passage extending along an axis through said apex of said protrusion, said liquid discharge passage communicating with said liquid supply port; and

a plurality of air discharge passages in said nozzle body and opening into said recess adjacent said base of said protrusion.  
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2. The nozzle of claim 1, wherein said recess has a generally conical shape.

3. The nozzle of claim 1, wherein each of said air discharge  
20 passages is angled in a direction generally toward said liquid discharge passage and offset from the axis of said liquid discharge passage.

4. The nozzle of claim 3, wherein said air discharge passages are oriented such that air issuing from each said air discharge passage is in a direction generally tangential to the direction of the liquid filament issuing from said liquid discharge passage.

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5. The nozzle of claim 1, wherein said plurality of air discharge passages are positioned in a generally square pattern about said liquid discharge passage.

10 6. The nozzle of claim 5, wherein each of said air discharge passages is offset by the same distance from the axis of said liquid discharge passage.

7. The nozzle of claim 5, wherein said air discharge passages  
15 positioned at diagonally opposed corners of said square pattern are symmetrically positioned relative to said liquid discharge passage.

8. The nozzle of claim 1, wherein each of said air discharge passages is offset from the axis of said liquid discharge passage by a  
20 distance at least equal to the radius of said liquid discharge passage.

9. The nozzle of claim 1, further comprising:  
a second recess formed in said second side of said nozzle  
body;  
a second frusto-conically shaped protrusion spaced from said  
5 first protrusion on said second side, including a base positioned within said  
second recess, an apex and a side surface converging toward said apex;  
a second liquid discharge passage extending along an axis  
through said apex of said second protrusion, said second liquid discharge  
passage communicating with said liquid supply port; and  
10 a second plurality of air discharge passages in said nozzle body  
and opening into said second recess adjacent said base of said second  
protrusion.
10. The nozzle of claim 9, wherein said second plurality of air  
15 discharge passages are positioned in a generally square pattern about said  
second liquid discharge passage.
11. The nozzle of claim 10, wherein each of said air discharge  
passages of said second plurality is offset by the same distance from the  
20 axis of said second liquid discharge passage.

12. The nozzle of claim 10, wherein said air discharge passages positioned at diagonally opposed corners of said square pattern are symmetrically positioned relative to said second liquid discharge passage.
- 5 13. The nozzle of claim 10, wherein each of said air discharge passages of said square pattern is offset from the axis of said second liquid discharge passage by a distance at least equal to the radius of said second liquid discharge passage.
- 10 14. The nozzle of claim 1, comprising:  
a plurality of recesses formed in said second side of said nozzle body;  
a plurality of frusto-conically shaped protrusions disposed on said second side, each protrusion including a base positioned within a  
15 respective one of said plurality of recesses, an apex and a side surface converging toward said apex;  
a plurality of liquid discharge passages, each liquid discharge passage extending along an axis through said apex of one of said protrusions, said liquid discharge passages communicating with said liquid  
20 supply port; and

a plurality of air discharge passages formed in said nozzle body and associated with each said protrusion, each said plurality of air discharge passages opening into one of said recesses, adjacent said base of an associated protrusion.

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15. An applicator for dispensing at least one liquid filament onto a moving substrate, comprising:

a module body;

10 a nozzle body coupled to said module body and having a first side and a second side, said first side including a liquid supply port and an air supply port communicating with respective liquid and air supply passages of a module body, and said second side including a recess;

a frusto-conically shaped protrusion on said second side including a base positioned within said recess, an apex and a side surface  
15 converging toward said apex;

a liquid discharge passage extending along an axis through said apex of said protrusion, said liquid discharge passage communicating with said liquid supply port; and

20 a plurality of air discharge passages in said nozzle body and opening into said recess adjacent said base of said protrusion, each of said air discharge passages angled in a direction generally toward said liquid discharge passage and offset from the axis of said liquid discharge passage.

16. The applicator of claim 15, further comprising:
- a second recess formed in said second side of said nozzle body;
- a second frusto-conically shaped protrusion spaced from said first protrusion on said second side, including a base positioned within said second recess, an apex and a side surface converging toward said apex;
- a second liquid discharge passage extending along an axis through said apex of said second protrusion, said second liquid discharge passage communicating with said liquid supply port; and
- a second plurality of air discharge passages in said nozzle body and opening into said second recess adjacent said base of said second protrusion.